



POLYETHYLENE (PE) HIGH DENSITY MOLDING COMPOUND, WASHER FLUID RESERVOIR

WSS-M4D695-B1

1. SCOPE

The material defined by this specification is a thermoplastic high density molding compound based on polyethylene.

2. APPLICATION

This specification was released originally for a blow molded high density polyethylene material used for windshield washer fluid reservoirs.

2.1 LIMITATIONS

This material does not contain UV stabilizers, long term exposure to direct sunlight will cause chalking and loss of gloss.

This material is susceptible to fluid stress cracking and high mold shrinkage.

3. REQUIREMENTS

3.1 APPROVED SOURCES

This specification requires the use of approved sources. Only the sources identified on the Ford Approved Source List (ASL) can be used when this specification is listed on the drawing, CAD file, or other documents. The list of approved sources is located within Ford at www.mats.ford.com or available externally through a Ford Materials Engineer.

3.2 CONDITIONING AND TEST CONDITIONS

All test values are based on material conditioned for not less than 24 h prior to testing in a controlled environment of 23 +/- 2 °C and 50 +/- 5% relative humidity. Testing of the material should occur in the conditioning environment or soon after removal.

3.3 INFRARED SPECTROPHOTOMETRY AND/OR THERMAL ANALYSIS

IR spectra and thermograms from initial material approval shall constitute the reference standard and shall be kept on file at the designated material laboratory. The material supplier shall ensure that all future material supplied to the specification shall produce IR spectra and thermograms that correspond to the reference standard when tested under the same conditions.

3.4 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

3.4.1 Many 4D resin specifications prior to 2011, identified certain requirements with the symbol (s), which indicated that the mean and +/- 3 sigma values were to be reported. The specification minimum, maximum or range was established using 3 sigma data. For 2011 and beyond, refer to Table 1 for number of samples required for each test.

Date	Action	Revisions	Rev. 02
2018 05 14	Revised	See Summary of Revisions	H. Santos, SA
2018 03 08	Editorial	See Summary of Revisions	C. Saige, NA
2017 09 15	Released		C. Saige, NA





- 3.4.2 The use of regrind is permitted, for economic / environmental reasons. Part manufacturers using this specification must complete DV and PV testing with the allowable amount of regrind and the maximum allowable regrind content must be specified on the engineering drawing. Any changes to what is specified on the drawing (no specific amount implies zero regrind) must be approved by Materials and PD Engineering through the formal Ford Motor Company process (SREA).
- 3.4.3 Performance Criteria:
Parts using this specification shall meet the appropriate performance specifications, WSS-M15P50-C2/Latest.
- 3.4.4 Ford Materials Engineering may request a Control Plan and Certificate of Analysis (C of A) containing lot testing requirements which must include, but are not limited to:

Density
Melt Flow Rate
Impact Strength, Notched Charpy at 23 °C
Flexural Modulus

3.5 SAMPLE PREPARATION

Specimens shall be as follows:

Specimen A	150 minimum x 10 x 4.0 +/- 0.2 mm (ISO 527-2, Specimen Type 1A)
Specimen B	355 x 100 x 1.0 +/- 0.1 mm
Specimen C	145 x 60 x 3.2 +/- 0.2 mm
Specimen D	80 x 10 x 4.0 +/- 0.2 mm (may be cut from the center of Specimen A)
Specimen E	100 mm diameter x 3.2 mm
Specimen F	80 mm diameter x 3.2 mm
Specimen G	90 mm x 200 mm
Specimen H	50 +/- 1 mm diameter x 3.2 +/- 0.2 mm
Specimen I	100 mm x 150 mm, min

All tests specimens shall be prepared from compression molded sheets to approximately 200 x 200 x 4.0 +/- 0.2 mm unless otherwise specified. Preparation of compression molded sheets according to ISO 293, except; aluminum foil, 180 - 200 °C molding temperature, 15 +/- 2 °C/minute cooling rate. The values of this specification are based on unannealed specimens. See Table 1 for the number of samples required.

3.6 MATERIAL PROPERTIES

3.6.1	Melt Flow Rate (ISO 1133 190 °C, 5.0 kg)	2.0 g/10 minutes max
3.6.2	Density (ISO 1183, Method A)	0.945 - 0.960 g/cm ³
3.6.3	Tensile Strength at Yield (ISO 527-1 and ISO 527-2, Specimen A, 50 mm/minute test speed)	20 MPa min
3.6.4	Elongation at Yield (ISO 527-1 and ISO 527-2, Specimen A, 50 mm/minute test speed)	8.0% min



3.6.5	Tensile Modulus (ISO 527-1 and ISO 527-2, Specimen A, 1 mm/minute test speed)	800 MPa min
3.6.6	Flexural Modulus (ISO 178, Specimen D, 64 mm support span, 2 mm/minute test speed)	1.0 GPa min
3.6.7	Impact Strength, Notched Charpy (ISO 179-1/1eA, Specimen D)	
3.6.7.1	At 23 +/- 2 °C	10 kJ/m ² min, Report Break Type
3.6.7.2	At -40 +/- 2 °C	5 kJ/m ² min, Report Break Type

The test specimen must be conditioned for minimum of 6 hours at the above specified temperature prior to impact test. Low temperature testing shall be done within the cold chamber, if not possible, test may be conducted outside, but within 5 seconds. Test specimens must be reviewed by Materials Engineering.

3.6.8	Heat Deflection Temperature (ISO 75-1 and ISO 75-2, Specimen D, flatwise, Bath – silicone oil, 0.34 +/- 0.1 mm deflection. At 1.80 MPa)	40 °C min
3.6.9	Heat Aging Performance (ISO 188, 1000 h at 90 +/- 2 °C. After heat aging test specimens are to be conditioned in a desiccator for 3 - 5 h at 23 +/- 2 °C. Unaged property values shall be determined at the time of the aged properties determination)	
3.6.9.1	Tensile Strength at Yield, Change (Test Method per para 3.6.3)	+/- 15% max
3.6.9.2	Impact Strength, Notched Charpy, Change (Test Method per para 3.6.7, specimens to be notched before Heat Aging)	- 15% max
3.6.10	Long Term Resistance to Fluids (continuous use) (Impact Strength, Notched Charpy, ISO 179-1/1eA, Specimen D specimens to be notched before immersion)	

Test materials that will be continuously exposed to the fluids below. Record the time and temperature for each fluid exposure. Samples are to be immersed in the fluid for the time and temperature specified. Report the loss of impact strength versus unaged values. Unaged samples shall be tested at the same time as the aged samples. *If a Ford material specification is being used and already contains this data, this testing does not have to be performed.* Proper safety precautions must be followed when handling hot and/or flammable fluids.